

CLAIMS

1. A wheel supporting apparatus comprising:

an elastic member (140, 150) attached to a load member (IWM, WG) provided
5 in a wheel (10, 20) of a wheel unit (100) and placed to allow vibrations of said wheel
unit (100) and vibrations of said load member (IWM, WG) to dampen each other;

a suspension arm (210, 220) having one end connected to said elastic member
(140, 150) and the other end fixed to a vehicle body pivotably in a top-bottom direction
of said vehicle body; and

10 a rotatably supporting member (180) connected to said suspension arm (210,
220) and said elastic member (140, 150) to rotatably support said wheel (10, 20).

2. The wheel supporting apparatus according to claim 1, wherein

said load member (IWM, WG) is an in-wheel motor (IWM) including:

15 a motor (70) generating motive power;

a motor output shaft (110) connected to said wheel (10, 20) via a constant
velocity joint (30) to allow the motive power generated by said motor (70) to be
transmitted to said wheel (10, 20); and

a case (60) housing said motor, and

20 said elastic member (140, 150) is attached to said case (60).

3. The wheel supporting apparatus according to claim 2, wherein

said motor output shaft (110) is comprised of:

a first output shaft (110A) connected to said motor; and

25 a second output shaft (110B) having one end fitted into said first output shaft
(110A) and the other end connected to said constant velocity joint (30).

4. The wheel supporting apparatus according to claim 1, wherein

said load member (IWM, WG) is a weight (WG) provided to said wheel (10, 20) without connected to said wheel (10, 20).

5 5. The wheel supporting apparatus according to any of claims 1 to 4, wherein said suspension arm (210, 220) is comprised of an upper arm (210) and a lower arm (220), and

 said elastic member (140, 150) is connected to at least one of said upper arm (210) and said lower arm (220).

10 6. The wheel supporting apparatus according to claim 5, wherein said elastic member is comprised of a pair of elastic members (140, 150), one of said pair of elastic members (140) is connected to said upper arm (210), and

 the other of said pair of elastic members (150) is connected to said lower arm (220).

 7. The wheel supporting apparatus according to claim 6, wherein said pair of elastic members (140, 150) is connected to said load member (IWM, WG) in the top-bottom direction of said vehicle body, and

20 said upper arm (210) and said lower arm (220) are connected to said pair of elastic members (140, 150) in the top-bottom direction of said vehicle body.

 8. The wheel supporting apparatus according to claim 7, wherein said pair of elastic members is comprised of:

25 a pair of front elastic members (340, 360) connected to said upper arm (210) and said lower arm (220) and attached to said load member (IWM, WG) in the top-bottom direction of said vehicle body; and

 a pair of rear elastic members (350, 370) connected to said upper arm (210) and

said lower arm (220) and attached to said load member (IWM, WG) in the top-bottom direction of said vehicle body, and

said pair of front elastic members (340, 360) and said pair of rear elastic members (350, 370) are placed in a front-rear direction of said vehicle body.

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9. The wheel supporting apparatus according to claim 8, wherein said pair of front elastic members (340, 360) and said pair of rear elastic members (350, 370) are each a rubber mount.

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10. The wheel supporting apparatus according to claim 8, wherein said pair of elastic members further includes a pair of middle elastic members (380, 390) connected to said upper arm (210) and said lower arm (220) and attached to said load member (IWM, WG) in the top-bottom direction of said vehicle body, and said pair of middle elastic members (380, 390) is made of a material different from a material of which said pair of front elastic members (340, 360) and said pair of rear elastic members (350, 370) are made and is placed between said pair of front elastic members (340, 360) and said pair of rear elastic members (350, 370) in the front-rear direction of said vehicle body.

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11. The wheel supporting apparatus according to claim 10, wherein said pair of front elastic members (340, 360) and said pair of rear elastic members (350, 370) are each comprised of a rubber mount, and said pair of middle elastic members (380, 390) is each comprised of a spring.

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12. The wheel supporting apparatus according to claim 10, wherein said pair of front elastic members (340, 360) and said pair of rear elastic members (350, 370) are each comprised of a spring, and said pair of middle elastic members (380, 390) is each comprised of a rubber

mount.

13. The wheel supporting apparatus according to claim 5, wherein
said elastic member is comprised of an upper elastic member (340, 350) and a
5 lower elastic member (360, 370),
said upper elastic member (340, 350) is connected to said upper arm (210), and
said lower elastic member (360, 370) is connected to said lower arm (220).

14. The wheel supporting apparatus according to claim 13, wherein
10 said upper elastic member (340, 350) and said lower elastic member (360, 370)
are attached to said load member (IWM, WG) in the top-bottom direction of said
vehicle body, and
said upper arm (210) and said lower arm (220) are connected respectively to said
upper elastic member (340, 350) and said lower elastic member (360, 370) in the top-
15 bottom direction of said vehicle body.

15. The wheel supporting apparatus according to claim 14, wherein
said upper elastic member (340, 350) and said lower elastic member (360, 370)
are each comprised of at least one elastic body.

20 16. The wheel supporting apparatus according to claim 15, wherein
said at least one elastic body (340, 350, 360, 370) is each a rubber mount.

17. The wheel supporting apparatus according to claim 14, wherein
25 said upper elastic member (340, 350, 380) and said lower elastic member (360,
370, 390) are each comprised of:
at least one first elastic body (340, 350, 360, 370); and
a second elastic body (380, 390) different from said first elastic body.

18. The wheel supporting apparatus according to claim 17, wherein
said at least one first elastic body (340, 350, 360, 370) is each a rubber mount,
and
said second elastic body (380, 390) is a spring.

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19. The wheel supporting apparatus according to claim 17, wherein
said at least one first elastic body (340, 350, 360, 370) is each a spring, and
said second elastic body (380, 390) is a rubber mount.

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20. The wheel supporting apparatus according to claim 5, wherein
said elastic member is comprised of a pair of elastic members (140A, 150A),
said pair of elastic members (140A, 150A) is connected to said upper arm (210)
via a pair of arm members (260, 270), and

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said lower arm (220) is provided to said load member (IWM) and said pair of
elastic members (140A, 150A) without connected to said load member (IWM) and said
pair of elastic members (140A, 150A), said lower arm having one end connected to said
rotatably supporting member (180) and the other end fixed to said vehicle body
pivotably in the top-bottom direction of said vehicle body.

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21. The wheel supporting apparatus according to claim 20, wherein
said pair of elastic members (140A, 150A) is attached to said load member
(IWM, WG) in the front-rear direction of said vehicle body,

said pair of arm members (260, 270) is connected to said pair of elastic members
(140A, 150A) in the front-rear direction of said vehicle body,

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said upper arm (210) has one end connected to said rotatably supporting member
(180) and said pair of arm members (260, 270) and the other end fixed to said vehicle
body pivotably in the top-bottom direction of said vehicle body, and

said upper arm (210) and said lower arm (220) are placed in the top-bottom

direction of said vehicle body.

22. The wheel supporting apparatus according to claim 20, wherein
said elastic members of said pair of elastic members (280, 290, 300, 310) are
5 placed on respective sides opposite to each other of said load member (IWM, WG) in a
front-rear direction of said vehicle body and are able to expand and contract in the top-
bottom direction of said vehicle body.

23. The wheel supporting apparatus according to claim 22, further comprising
10 an extension member (320) fixed to said load member (IWM, WG) and extending from
said load member (IWM, WG) in the front-rear direction of said vehicle body, wherein
said pair of elastic members (280, 290, 300, 310) has one end connected to said
extension member (320) and the other end connected to said pair of arm members (260,
270).

24. The wheel supporting apparatus according to claim 22 or 23, wherein
15 said pair of elastic members (280, 290, 300, 310) includes a pair of suspensions
(280, 290).

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